

# WIDESTRIKE™ PLANT INCORPORATED PROTECTANT TRAIT EFFICACY ON HELIOTHINE SPECIES

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## Introduction

WideStrike™ *Insect Protection* gene technology is a *Bt* pyramided trait (Cry 1F and Cry 1Ac) incorporated into certain cotton varieties produced by Phytogen Seed Company LLC and is known to have good efficacy against budworm and bollworm. WideStrike™ cotton has been evaluated since 2003 at the Southeastern Branch Research and Education Center (SEB) near Midville and the present study conducted in 2006 was a continued assessment of WideStrike™ field performance at that location.

## Methods

Treatment plots were planted with a 4-row John Deere® vacuum planter in 40-foot long x 38-inch wide rows arranged in a randomized complete block experimental design with 15-foot alleys separating blocks, replicated four times. Temik® 15G @ 3.5 lbs/acre was applied in the seed furrow of all cotton at planting for early season thrips control, but no additional insecticide applications were made during the season. Normal agronomic practices of fertilization, weed control, and irrigation used for cotton at the SEB were used in the tests. The two center rows of each plot were harvested with a mechanical spindle picker and weighed for assessment of yield.

Surveys of insect infestation and plant injury were done weekly or at other specified intervals during the season after cotton fruiting had begun. Plant terminals and two each of squares, flowers, and bolls on 20 plants selected at random in the center two rows of each plot were examined for injury and the presence of larvae. Hartstack-style traps were located near the test fields, one each baited with sex pheromone of *H. zea* and *Heliothis virescens* (Fabricius). Moth captures were monitored weekly during the season. Data analysis utilized SAS (Statistical Analysis System) for ANOVA at  $P < 0.05$  with mean separation using LSD for percent damage.

## Results and Discussion

Breeding lines expressing the WideStrike™ plant incorporated protectant trait were PHY 485 WRF, PHY 480 WR, PHY 470 WR, PHY 370 WR, and two lines that did not have the two *Bt* transgenes were PHY 425 RF and PHY 310 R. No foliar insecticides were used in this test during the season. Table 1 shows overall infestation of fruiting structures during the season and yield of the different cotton lines. For comparison to non*Bt* cotton sprayed with various insecticides during the season, refer to Table 1 of the report titled "Performance of Insecticides with Different Physiological Targeting of Bollworm In Non*Bt* Cotton" published in this bulletin. The pheromone trap captures of

male bollworm and budworm moths published in the above paper would also apply to the Widestrike™ field. The two cotton fields were located adjacent to each other (the nonBt cotton in the adjacent field was DP 494R). The data shows that all the breeding lines expressing the Widestrike™ Bt toxins controlled infestations as well as most of the insecticide treatments in the adjacent field.

Tables 2, 3, and 4 show infestation data on different developmental stages (squares, flowering squares, and bolls, respectively) of cotton fruiting structures, and the data indicates that most damage in Widestrike™ lines occurred with squares. Infestation of flowering squares and bolls was low throughout the season and was substantially less than the two nonBt lines on 7/25, 8/1, and 8/8. Terminal damage was generally reduced in the Widestrike™ lines compared to the two nonBt cotton types, but on 7/25 and 8/1, considerable % terminal injury occurred in Widestrike™. Overall, the results confirm previous research demonstrating that Widestrike™ cotton produces good season-long control of heliothine infestations.

**Table 1.** Heliothine infestation of Widestrike™ cotton fruiting structures, Midville, GA

	% Fruiting Structures Damaged by Date <sup>1</sup>						Yield Lbs <sup>2</sup>
	7/11	7/17	7/25	8/1	8/8	8/15	
PHY 485 WRF <sup>3</sup>	0.4 c	1.5 c	3.3 b	3.3 b	5.8 bc	2.3 a	4228 ab
PHY 480 WR	0.0 c	1.0 c	1.5 b	4.0 b	3.3 c	0.6 a	4254 a
PHY 470 WR	0.4 c	2.7 c	3.5 b	5.2 b	1.5 c	0.0 a	3743 ab
PHY 370 WR	0.6 bc	2.5 c	1.7 b	4.0 b	2.1 c	1.3 a	3691 b
PHY 425 RF	6.3 a	14.8 a	19.6 a	40.2 a	13.8 b	1.9 a	2973 c
PHY 310 R	2.5 b	7.9 b	23.5 a	42.1 a	25.2 a	1.9 a	3145 c

<sup>1</sup> Means followed by the same letter in a row are not significantly different, LSD (P < 0.05).

<sup>2</sup> Lbs per acre seed cotton.

<sup>3</sup> PHY 485 WRF, PHY 480 WR, PHY 470 WR, and PHY 370 WR had Widestrike™ (Cry 1F and Cry 1Ac), PHY 425 RF and PHY 310 R had no Widestrike™ Cry transgenes.

**Table 2.** Heliothine infestation of Widestrike™ cotton squares, Midville, GA

	% Squares Damaged by Date <sup>1</sup>						
	7/11	7/17	7/25	8/1	8/8	8/15	Avg.
PHY 485 WRF	0.6 c	2.5 cd	8.1 bc	7.5 b	7.5 bc	3.1 a	5.0
PHY 480 WR	0.0 c	1.9 c	3.1 c	8.8 b	2.5 bc	0.6 a	2.8
PHY 470 WR	1.3 c	7.5 bc	7.5 bc	8.8 b	1.3 c	0.0 a	4.4
PHY 370 WR	1.3 c	1.9 d	4.4 c	8.1 b	1.9 c	1.3 a	3.1
PHY 425 RF	15.6 a	35.7 a	25.0 ab	55.0 a	13.1 b	3.1 a	24.6
PHY 310 R	6.3 b	13.8 b	28.8 a	50.6 a	25.0 a	2.5 a	21.1

<sup>1</sup> Means followed by the same letter in a row are not significantly different, LSD (P < 0.05).

**Table 3.** Heliothine infestation of Widestrike™ cotton flowers, Midville, GA

	% Flowers Damaged by Date <sup>1</sup>						
	7/11	7/17	7/25	8/1	8/8	8/15	Avg.
PHY 485 WRF	0.6 a	0.6 a	1.9 b	1.9 b	5.6 ab	0.6 a	1.9
PHY 480 WR	0.0 a	1.3 a	1.3 b	1.9 b	3.1 b	1.3 a	1.5
PHY 470 WR	0.0 a	0.6 a	2.5 b	3.8 b	1.9 b	0.0 a	1.5
PHY 370 WR	0.6 a	2.5 a	0.0 b	2.5 b	1.9 b	1.3 a	1.5
PHY 425 RF	1.9 a	6.3 a	15.0 a	23.8 a	12.5 a	0.6 a	10.0
PHY 310 R	0.0 a	6.3 a	19.4 a	25.7 a	7.5 ab	1.9 a	10.1

<sup>1</sup> Means followed by the same letter in a row are not significantly different, LSD (P < 0.05).

**Table 4.** Heliothine infestation of Widestrike™ cotton bolls, Midville, GA

	% Bolls Damaged by Date <sup>1</sup>						Avg.
	7/11	7/17	7/25	8/1	8/8	8/15	
PHY 485 WRF	0.0 a	1.3 a	0.0 b	0.6 b	4.4 b	3.1 a	1.6
PHY 480 WR	0.0 a	0.0 a	0.0 b	1.3 b	4.4 b	0.0 a	0.9
PHY 470 WR	0.0 a	0.0 a	0.6 b	3.1 b	1.3 b	0.0 a	0.8
PHY 370 WR	0.0 a	3.1 a	0.6 b	1.3 b	2.5 b	1.3 a	1.5
PHY 425 RF	1.3 a	2.5 a	18.8 a	41.9 a	15.6 b	1.9 a	13.6
PHY 310 R	1.3 a	3.8 a	22.5 a	50.0 a	43.1 a	1.3 a	20.3

<sup>1</sup> Means followed by the same letter in a row are not significantly different, LSD (P < 0.05).

**Table 5.** Heliothine infestation of Widestrike™ cotton terminals, Midville, GA

	% Terminals Damaged by Date						Avg.
	7/11	7/17	7/25	8/1	8/8	8/15	
PHY 485 WRF	0.0 a	3.8 b	11.3 a	10.0 b	11.3 b	0.0 b	6.0
PHY 480 WR	0.0 a	2.5 b	12.5 a	8.8 b	5.0 b	2.5 ab	5.2
PHY 470 WR	2.5 a	6.3 b	10.0 a	21.3 ab	6.3 b	5.0 ab	8.5
PHY 370 WR	1.3 a	2.5 b	17.5 a	6.3 b	3.8 b	2.5 ab	5.6
PHY 425 RF	1.3 a	21.3 a	17.5 a	41.3 a	20.0 b	3.8 ab	17.5
PHY 310 R	2.5 a	17.5 a	23.8 a	42.5 a	41.3 a	6.3 a	22.3

<sup>1</sup> Means followed by the same letter in a row are not significantly different, LSD (P < 0.05).